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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/708,775

03/24/2004

David R. Hall

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12/23/2005

JEFFREY E. DALY

INTELLISERV, INC

400 N. SAM HOUSTON PARKWAY EAST

SUITE 900

HOUSTON, TX 77060

EXAMINER

NATALINI, JEFF WILLIAM

ART UNIT

PAPER NUMBER

2858

DATE MAILED: 12/23/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/708,775

Applicant(s)

HALL ET AL.

Examiner

Jeff Natalini

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 September 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 and 28-35 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-21 and 28-35 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

Claim Objections

1. Claims 1 and 20 are objected to because of the following informalities:
 - In regard to claim 1, in line one of the claim "connectivity in transmission path" should be changed to "connectivity in a transmission path".
 - In regard to claim 20, this claims should depend from claim 19, and should state "the signal processor" not "a signal processor", as it stands now there is no correspondence with how the signal processor works into claim 14 from which this claim depends from.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 14, and 28 are rejected under 35 U.S.C. 102(e) as being anticipated by Anderson et al. (US publication 20050050726).

Anderson et al. discloses an apparatus/method for testing electromagnetic connectivity (paragraph 80; pg 4) in a drill string (paragraph 131 pg 8): a drill string with a transmission path in the drill string (paragraph 130-131 pg 8); a signal generator/test

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apparatus electromagnetically coupled to the transmission path for transmitting an electromagnetic signal in the path (paragraph 80; EMAT or piezo-electric transducer); a receiver for reflection of the test signal and determining from the reflection whether there is an interruption in the electromagnetic connectivity in the transmission path (paragraph 80; defects are detected).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-5, 11, 14-16, 28, 29, and 32 are rejected under 35 U.S.C. 102(b) as being anticipated by Tanigushi et al. (5568448) in view of Hall, Jr. et al. (5175429).

In regard to claims 1, 3, 14, and 28, Tanigushi et al. teaches an apparatus/method for testing electromagnetic connectivity in a drill string (col 24 line 48-65): a drill string (fig 9 or 10 (device 4 through to the bit)) with a transmission path in the drill string (path through string in both figs 9 and 10); a signal generator/test apparatus (fig 10 (10)) electromagnetically coupled to the transmission path (fig 10, col 11 line 63-65); a receiver for reflection of the test signal (col 22 line 63-col 23 line 2) and determining from the reflection whether there is an interruption in the electromagnetic connectivity in the transmission path (col 24 line 60-64, defects mentioned here as

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known in the art would be discontinuities or disconnections based on the reflected wave characteristics compared to the reflection of a wave at known non error conditions).

Taniguish et al. lacks specifically wherein the signal transmitted (from the signal generator) is an electromagnetic test signal.

Hall, Jr. et al. discloses in a MWD system (the same used in Taniguish et al.) that instead of a sonic system a electromagnetic pulse can be used and the reflection measured (col 3 line 8-24).

It would have been obvious to one with ordinary skill in the art at the time the invention was made for Taniguish et al. to incorporate a electromagnetic test signal instead of an ultrasonic test signal as they both will be able to determine distance (to a fault/discontinuity or the bottom or side of the hole) by reflection data as taught by Hall, Jr. et al. in order to provide rapid sensing for accurate position sensing.

In regard to claims 2, 15, and 16, Tanigushi et al. in his invention does not use a sine wave while transmitting a test signal.

Tanigushi et al. teaches that it is known in the art to use a sine wave signal (fig 7(1) and 7(2)) while transmitting a test signal with a crystal based oscillator (col 3 line 60-col 4 line 9).

It would have been obvious to one with ordinary skill in the art at the time the invention was made for Taniguishi et al. to incorporate a crystal based oscillator producing a sine wave in order for the ultrasonic vibration to have a longitudinal wave and a transverse wave.

In regard to claim 4 and 5, Taniguish et al. discloses transmitting the test signal across a plurality (would include the specifics of a single joint) of electromagnetically coupled joints (fig 10 shows a joint between magnetostriction generator and the drill string, and many coupled joints throughout the drill string in fig 9 or 10 are similar to those shown by applicant in fig 1).

In regard to claim 11, Taniguish et al. generates the test signal (col 10 line 21-25).

In regard to claim 13, Taniguish et al. implies that there is an indication of an interruption of the electromagnetic connectivity in the transmission path (col 24 line 62-64, states that the defects are diagnosed (identified), inspected and monitored; performing the inspection/monitoring is an indication that the defect is identified.

In regard to claim 29, Taniguish et al. discloses the drill sting includes a section of a drill bit (fig 9, the very bottom of the drill string shows a drill bit).

In regard to claim 32, Taniguish et al. discloses the testing apparatus is hosted on a non-dedicated portion of the pipe (fig 10, the testing apparatus (10) is hosted outside of the drill string).

5. Claims 6-10, 12-13, 19-21, 30, 31, 33, and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanigushi et al. (5568448) and Hall, Jr. et al. (5175429) in view further view of Pacault et al. (Pub 2005/0046591).

Tanisguish et al. as modified by Hall, Jr. et al. discloses as noted above in claims 1, 14, and 28.

Taniguishi et al. as modified lacks specifically stating :

- wherein receiving the reflection includes indicating one of a good connection or a bad connection in the drill string (claim 6);
- wherein receiving the reflection indicating a bad connection/determining an interruption includes receiving a signal indicating on of shorted box end, an open box end, a shorted pin end, or an open pen end (claims 7 and 8);
- wherein determining an interruption includes a signal processor that compares the reflection to a reference (claims 9 and 19);
- wherein determining comparing the reflection includes electronically comparing the reflection to a reference (claim 10);
- wherein the reflection is displayed before the determination (claim 12);
- wherein there is an indication of (or means for indicating) an interruption of the electromagnetic conductivity (claim 13 and 21);
- wherein there is a signal processor has a programmed computing apparatus (claim 20);
- wherein the transmission path includes: a first pair of electromagnetic couplers, a first conductor electrically connecting the first pair of electromagnetic couplers, a second conductor and a second pair of electrically magnetic couplers connected by the second conductor, one of

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the second pair of couplers being electromagnetically coupled to one of the first pair of couplers (claim 30);

- wherein the testing apparatus comprises a dedicated section of the drill string (claim 31);
- wherein means for determining from the reflection whether there is an interruption in the electromagnetic connectivity in the transmission path (claim 33);
- wherein the system has a downhole local area network over which the testing apparatus can transmit the data representing the reflection of the test signal (claim 35).

Pacault et al. discloses:

- wherein receiving the reflection includes indicating one of a good connection or a bad connection in the drill string (last sentence of paragraph determines existence of fault (bad=existence, good= no fault));
- wherein receiving the reflection indicating a bad connection/determining an interruption includes receiving a signal indicating on of shorted box end, an open box end, a shorted pin end, or an open pen end (abstract- "the fault in the wired drill pipe telemetry system is identified" the identity would tell if its is a shorted box, open box, etc...as errors stated in para [5]);
- wherein determining an interruption includes a signal processor that compares the reflection to a reference (para [12] last sentence);

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- wherein determining comparing the reflection includes electronically comparing the reflection to a reference (para [12] last sentence);
- wherein the reflection is displayed before the determination (figs 20-23 display the reflected pulse- para [24]);
- wherein there is an indication of (or means for indicating) an interruption of the electromagnetic conductivity (para [48], explains after a fault is indicated it must be identified)
- wherein there is a signal processor has a programmed computing apparatus (para [36] last sentence);
- wherein the transmission path includes: a first pair of electromagnetic couplers, a first conductor electrically connecting the first pair of electromagnetic couplers, a second conductor and a second pair of electrically magnetic couplers connected to the second conductor, one of the second pair of couplers being electromagnetically coupled to one of the first pair of couplers (conductors 21 and 31 (fig 2) are connected through conductors 5a, 5b (fig 1) and the drill string could have many couplers between pipes (para [31-32]) also Pacault et al. states that these couplers could all be magnetic couplers also (para [39]) and would be coupled together to transmit proper signals);
- wherein the testing apparatus comprises a dedicated section of the drill string (fig 1 and claim 23 instill how the testing apparatus is a part of the drill string);

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- wherein means for determining from the reflection whether there is an interruption in the electromagnetic connectivity in the transmission path (abstract last sentence);
- wherein the system has a downhole local area network over which the testing apparatus can transmit the data representing the reflection of the test signal (para [29]).

It would have been obvious to one with ordinary skill in the art at the time the invention was made for Tanigushi et al. as modified to incorporate the above limitations in a drill bit detection system/method as taught by Pacalut et al. in order to test the reliability of conductive wires forming a wired drill pipe and quickly identify any failure (para [4]).

6. Claims 17 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanigushi et al. (5568448) and Hall, Jr. et al. (5175429) in view of Meador et al. (4785247).

Tanigushi et al. as modified by Hall, Jr. et al. lacks wherein at least one of the generator and receiver includes a coil through which a test signal is generated by the signal generator and transmitted into the drill string.

Meador et al. teaches wherein the transmitter (in this case transmitter is passing signal through for measuring formation parameter in drill string) and receiver have coils (fig 7 (119,122)) and coil are arranged in the drill string to transmit signals through (abstract).

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It would have been obvious to one with ordinary skill in the art at the time the invention was made for Tanigushi et al. as modified to have a coil the generator and receiver (though the claim only needs a coil in one) and have a coil through which the signal generated by the signal genitor transmits into a drill string as taught by Meador et al. in order to allow for efficient propagation and reception.

7. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tanigushi et al. (5568448), Hall, Jr. et al. (5175429), Meador et al. (4785247) and further in view of Spikerman (4314479).

Taniguishi et al. as modified by Hall, Jr. et al. and Meador et al. discloses as above.

Taniguishi et al. as modified lacks wherein the coil of the signal generator and the receiver is shared.

Spikerman teaches wherein a generator and receiver share a coil in an apparatus for transmitting and receiving electromagnetic pulses (col 6 line 58-62).

It would have been obvious to one with ordinary skill in the art at the time the invention was made for Taniguishi et al. as modified to have the generator and receiver share a coil as taught by Spikerman in order to lower design area and cost.

Response to Arguments

8. The arguments filed with the amendment on 9/12/05 are persuasive and a new ground of rejection is used to reject the amended claims. After consideration of the

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arguments as well as the prior art examiner decided that the difference between an acoustic signal and an electromagnetic signal is an obvious variant and the prior art shows this as seen in the rejection above. Also seen in the reference, used in the new 102 rejection (Anderson et al.), an electromagnetic acoustic transducer (paragraph 80 pg 4) is disclosed, which further shows the similar scope of acoustics and electromagnetic signals.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Hay et al. (6531871) discloses an extension assembly for an electromagnetic antenna and method of connection. Maekawa et al. (magazine article from IEEE March 1992) discloses Electric field analysis in the earth considering attenuation of electromagnetic waves propagated in lossy media.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

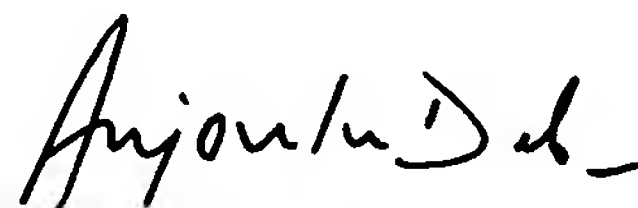
extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeff Natalini whose telephone number is 571-272-2266. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diane Lee can be reached on 571-272-2399. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jeff Natalini



ANJAN DEB
PRIMARY EXAMINER